

# Amendments To The Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

## Listing of claims:

### 1-50. (Cancelled).

- 51. (Previously Presented) A method of producing a composite solid polymer electrolyte membrane (SPEM) comprising a porous polymer substrate interpenetrated with an ion-conducting material, said method comprising the steps of preparing a mixture of the polymer substrate and the ion-conducting material and casting or extruding the composite SPEM from the mixture, and wherein
- (i) the porous polymer substrate comprises a homopolymer or copolymer of a liquid crystalline polymer or a solvent soluble thermoset or thermoplastic aromatic polymer; and
- (ii) the ion-conducting material comprises a homopolymer or copolymer of at least one of a sulfonated, phosphonated or carboxylated ion-conducting aromatic polymer or a perfluorinated ionomer.
- 52. (Previously Presented) The method of claim 51, wherein the SPEM is substantially thermally stable to temperatures of at least about 100°C.
- 53. (Previously Presented) The method of claim 51, wherein the SPEM is substantially thermally stable from at least about 100°C to at least about 175°C.
- 54. (Previously Presented) The method of claim 51, wherein the liquid crystalline polymer substrate comprises a lyotropic liquid crystalline polymer.



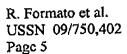
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- 55. (Previously Presented) The method of claim 54, wherein the lyotropic liquid crystalline polymer substrate comprises at least one of a polybenzazole (PBZ) and polyaramid (PAR) polymer.
- 56. (Previously Presented) The method of claim 55, wherein the polybenzazole polymer substrate comprises a homopolymer or copolymer of at least one of a polybenzoxazole (PBO), polybenzothiazole (PBT) and polybenzimidazole (PBI) polymer and the polyaramid polymer comprises a homopolymer or copolymer of a polypara-phenylene terephthalamide (PPTA) polymer.
- 57. (Previously Presented) The method of claim 51, wherein the thermoset or thermoplastic aromatic polymer substrate comprises at least one of a polysulfone (PSU), polyimide (PI), polyphenylene oxide (PPO), polyphenylene sulfoxide (PPSO), polyphenylene sulfide (PPS), polyphenylene sulfide sulfone (PPS/SO<sub>2</sub>), polyparaphenylene (PPP), polyphenylquinoxaline (PPQ), polyarylketone (PK) and polyetherketone (PEK) polymer.
- 58. (Previously Presented) The method of claim 57, wherein the polysulfone polymer substrate comprises at least one of a polyethersulfone (PES), polyetherethersulfone (PEES), polyarylethersulfone (PAS), polyphenylsulfone (PPSU) and polyphenylenesulfone (PPSO<sub>2</sub>) polymer; the polyimide (PI) polymer comprises a polyetherimide (PEI) polymer; the polyetherketone (PEK) polymer comprises at least one of a polyetherketone (PEK), polyetheretherketone (PEK), polyetheretherketone (PEEK), polyetherketone-ketone (PEKK), polyetheretherketone-ketone (PEKKK) polymer; and the polyphenylene oxide (PPO) polymer comprises a 2,6-diphenyl PPO or 2,6 dimethyl PPO polymer.
- 59. (Previously Presented) The method of claim 51, wherein the ion-conducting aromatic polymer comprises a wholly aromatic ion-conducting polymer.
- 60. (Previously Presented) The method of claim 51, wherein the ion-conducting aromatic polymer comprises a sulfonated, phosphonated or carboxylated polymer.



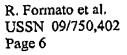
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- 61. (Previously Presented) The method of claim 60, wherein the polyimide polymer is fluorinated.
- 62. (Previously Presented) The method of claim 59, wherein the wholly-aromatic ion-conducting polymer comprises a sulfonated derivative of at least one of a polysulfone (PSU), polyphenylene oxide (PPO), polyphenylene sulfoxide (PPSO), polyphenylene sulfide (PPS), polyphenylene sulfide sulfone (PPS/SO<sub>2</sub>), polyparaphenylene (PPP), polyphenylquinoxaline (PPQ), polyarylketone (PK), polyetherketone (PEK), polybenzazole (PBZ) and polyaramid (PAR) polymer.
  - 63. (Previously Presented) The method of claim 62, wherein:
- (i) the polysulfone polymer comprises at least one of a polyethersulfone (PES), polyetherethersulfone (PES), polyarylsulfone, polyarylethersulfone (PAS), polyphenylsulfone (PPSU) and polyphenylenesulfone (PPSO<sub>2</sub>) polymer,
- (ii) the polybenzazole (PBZ) polymer comprises a polybenzoxaxole (PBO) polymer;
- (iii) the polyetherketone (PEK) polymer comprises at least one of a polyetherketone (PEK), polyetherketone (PEKK), polyetherketone-ketone (PEKK), polyetherketone-ketone (PEKKK) and polyetherketone-ketone (PEKEKK) polymer; and
- (iv) the polyphenylene oxide (PPO) polymer comprises at least one of a 2,6-diphenyl PPO, 2,6-dimethyl PPO and 1,4-poly phenylene oxide polymer.
- 64. (Previously Presented) The method of claim 51, wherein the perfluorinated ionomer comprises a homopolymer or copolymer of a perfluorovinyl ether sulfonic acid.
- 65. (Previously Presented) The method of claim 64, wherein the perfluorovinyl ether sulfonic acid is carboxylic-(COOH), phosphonic-(PO(OH)<sub>2</sub>) or sulfonic-(SO<sub>3</sub>H) substituted.

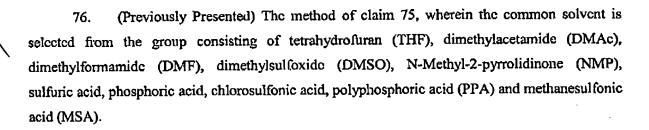


- 66. (Previously Presented) The method of claim 51, wherein the ion-conducting material comprises at least one of a polystyrene sulfonic acid (PSSA), poly(trifluorostyrene) sulfonic acid, polyvinyl phosphonic acid (PVPA), polyacrylic acid and polyvinyl sulfonic acid (PVSA) polymer.
- 67. (Previously Presented) The method of claim 51, wherein the porous polymer substrate comprises a homopolymer or copolymer of at least one of a substituted or unsubstituted polybenzazole polymer, and wherein the ion-conducting material comprises a sulfonated derivative of a homopolymer or copolymer of at least one of a polysulfone (PSU), polyphenylene sulfoxide (PPSO) and polyphenylene sulfide sulfone (PPS/SO<sub>2</sub>) polymer.
- 68. (Previously Presented) The method of claim 67, wherein the polysulfone polymer comprises at least one of a polyethersulfone (PES) and polyphenylsulfone (PPSU) polymer.
- 69. (Previously Presented) The method of claim 51, further comprising cross-linking the ion-conducting material to form sulfone crosslinkages.
- 70. (Previously Presented) The method of claim 51, further comprising chlorinating or brominating the ion-conducting material.
- 71. (Previously Presented) The method of claim 51, further comprising adding antioxidants to the ion-conducting material.
- 72. (Previously Presented) The method of claim 51, further comprising purifying the ion-conducting material.
- 73. (Previously Presented) The method of claim 72, wherein purifying the ion-conducting material comprises dissolving the ion-conducting material in a suitable solvent and precipitating the ion-conducting material into a suitable non-solvent.





- 74. (Previously Presented) The method of claim 72, wherein purifying the ion-conducting material comprises substantially removing overly sulfonated or degraded fractions of the ion-conducting material.
- 75. (Previously Presented) The method of claim 51, wherein the mixture of the polymer substrate and ion-conducting material is prepared in a common solvent.



#### 77-117. (Cancelled).

- 118. (Previously Presented) A method of producing a composite solid polymer electrolyte membrane (SPEM) comprising a porous polymer substrate interpenetrated with an ion-conducting material, said method comprising the steps of preparing a mixture of the polymer substrate and the ion-conducting material in a common solvent and casting or extruding the composite SPEM from the mixture, and wherein the SPEM is substantially thermally stable to temperatures of at least about 100°C.
- 119. (Previously Presented) A method of producing a composite solid polymer electrolyte membrane (SPEM) comprising a porous polymer substrate interpenetrated with an ion-conducting material, said method comprising the steps of preparing a mixture of the polymer substrate and the ion-conducting material and extruding or casting a composite film directly from the mixture, and wherein the SPEM is substantially thermally stable to temperatures of at least about 100°C.

#### 120. (Cancelled).

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- 121. (Previously Presented) A method as in any of 118-120, wherein the SPEM is stable from at least about 100°C to about 175°C.
- 122. (Previously Presented) A method as in any of claims 118-120, wherein the SPEM is stable from at least about 100°C to about 150°C.

  wherein
- 123. (Previously Presented) A method as in any of claims 118-120, wherein the porous polymer substrate comprises a homopolymer or copolymer of a liquid crystalline polymer or a solvent soluble thermoset or thermoplastic aromatic polymer.
- 124. (New) A method of producing a composite solid polymer electrolyte membrane (SPEM) comprising a porous polymer substrate interpenetrated with an ion-conducting material, said method comprising the steps of preparing a mixture of the polymer substrate and the ion-conducting material and processing the mixture to form the composite SPEM, and wherein
- (i) the porous polymer substrate comprises a homopolymer or copolymer of a liquid crystalline polymer or a solvent soluble thermoset or thermoplastic aromatic polymer; and
- (ii) the ion-conducting material comprises a homopolymer or copolymer of at least one of a sulfonated, phosphonated or carboxylated ion-conducting aromatic polymer or a perfluorinated ionomer.